INFORMATION REPORT INFORMATION REPORT

CENTRAL INTELLIGENCE AGENCY

SECRET

25X1

COUNTRY East Germany/Soviet Bloc

SUBJECT The Industrial Utilization of Coal in East Germany

REPORT

DATE DISTR. 23 OCT 1956

NO. PAGES 10

REQUIREMENT NO.

REFERENCES

25X1

DATE OF INFO.

PLACE & DATE ACQ.

SOURCE EVALUATIONS ARE DEFINITIVE. APPRAISAL OF CONTENT IS TENTATIVE.

25X1

SECRET

STATE	ARMY	NAVY	AIR	FBI	AEC	ORR Ev	
	#x	#x	x	#x		x	

25X1

(Note: Washington distribution indicated by "X"; Field distribution by "#".)

INFORMATION REPORT INFORMATION REPORT

SECRET

REGARDING THE INDUSTRIAL UTILIZATION OF COAL [redacted] 25X1

(Report by the D.D.R.)

Definition of the Term "Industrial Utilization"

1. In order to discuss the industrial utilization of low-calorie soft brown coal, we must first examine the meaning of the term "industrial utilization." Obviously, we have to think not merely in terms of producing calories. The chief method of enrichment of soft brown coal in the DDR is by the production of briquettes, the importance of which consists in the increase of calorific content and its value in terms of form. As long as the briquettes are used only for heating purposes, whether in manufacture or for home consumption, the process of briquette production cannot be included in the term "industrial utilization of soft brown coal." Even the fact that in the production of briquettes an excess of electrical power is obtained and is utilized in the form of a by-product, does not permit us to include briquette production in the industrial utilization of soft brown coal.

2. In countries where hard brown coal is mined, the following methods are used: After it is initially broken up and put through a sieve, it is classified according to size, 20 mm. or less and over 20 mm. The former is converted to electrical power, and coal larger than 20 mm is washed free of ash and then subjected to Fleissner's steam pressure method; the dry coal is sorted and then sold for home consumption according to size and quality. The products received are electric power and enriched coal, the calorific value of which has been increased by washing and drying which improves the stability of form during storage. Must one consider such a process "industrial utilization of coal"? We do not support this opinion because the utilization of coal fundamentally is directed toward its combustion, partly in enriching plants and partly by the consumer.

3. In the instances cited, only the physical enrichment of coal is carried out by means of the process of washing, drying and briquette making. The organic substance of the coal remains untouched. Only through burning is it destroyed. It is clear that we can speak about the "industrial utilization" of coal only if along with the physical processing occur also thermo-chemical processes as a result of which the organic nature is decomposed or transformed into solid, liquid, or gaseous products.

4. We will consider now the case of a simple, semi-coking plant of the type of which a number exist here in the DDR. Soft brown coal is formed into briquettes at the factory manufacturing low-temperature briquettes. Briquettes are converted into semi-coking fuel at a semi-coking plant. Semi-coking fuel is obtained in the form of a solid product. Tar, medium oil, light oil are the liquid products. All of these products are put on the market for sale, in addition to which sometimes part of the semi-coking fuel is burned in boilers. The low-temperature gas, as a rule, is consumed in its own production. In such a simple semi-coking plant which exists in the DDR, it is not acceptable to refer to this process as "industrial utilization" of soft brown coal.

5. Thus, the concept of "industrial utilization" is not fully embraced by the criterion that a thermo-chemical or other chemical transformation of the coal substance must take place. On the contrary, a still further condition is added that several (at least two) methods of converting the coal substance must be united in a single Kombinat. Only then is it possible to speak about "industrial utilization" in the full comprehensiveness of this concept.

SECRET

6. In such a case it is possible to distinguish:

A. Industrial utilization, with special emphasis on liquid products.

B. Industrial utilization, with special emphasis on gas.

C. Industrial utilization, with special emphasis on electric power.

D. Industrial utilization, with special emphasis on coke.

With respect to the third case (C), in the USSR the technical term "energo-technological utilization of coal" (energotekhnologicheskoye ispol'zovaniye uglya) has been created.

Previous Development in the D.D.R.

7. In Germany the primary effort in "industrial utilization" of soft brown coal up to this time has lain in obtaining liquid products (tar, medium oil and light oil) from low-temperature coals (i.e. brown coals with a tar content in excess of 12 percent of the dry mass and in maximum cases of 14 to 18 percent) and in the burning of semi-coking fuel and superfluous low-temperature gas in power stations operating in conjunction with a plant manufacturing semi-coking fuel. Such a Kombinat is called a "low-temperature-station." Subsidiary products, phenol, sulphur and ketone, are also obtained in large Kombinate in the cities of Böhlen and Espenhain in the DDR are known examples of such low-temperature-electric stations. The basic products produced for sale are liquid products (tar, light oil) and electric power; subsidiary products are phenol, sulphur and ketone. In such cases, it is not correct to speak of low-temperature-electric stations if all the semi-coking fuel produced is consumed in the electric power station and an insignificant part is put on the market, as for example, in Espenhain. The German technical term "low-temperature-electric station," which in all probability cannot easily be translated into the Russian language, indicates that in construction technology, the low-temperature plant and the electric station are equal.

8. The electric power station is operated in conjunction with a low-temperature plant, not only because of the fact that it obtains semi-coking fuel and superfluous low-temperature gas, but because it provides the low-temperature plant with the necessary steam for drying the coal and for the manufacture of semi-coking fuel and with the required electric power. Therefore the electric power station operates with a combined method of condensation and counter-pressure; as a result of this, the requirement in heat per kilowatt hours is favorable.

9. The Kombinat "Böhlen is a complicated type of industrial utilization process at of soft brown coal. As a result of the processing of tar by way of hydrogenation, it is transformed into a combined low-temperature-electric station and hydrogenation plant. Later, a gas plant was even added, so that the Kombinat "Otto Grotewohl," in the form of an amalgamated low-temperature electric station, hydrogenation plant, and gas plant, today is the most interesting example of industrial utilization of soft brown coal on our planet. The basic products of this Kombinat are benzine (or benzine diesel fuel, fuel oil, paraffin) electric power, and gas for long-distance piping; liquefied gases, sulphurs, phenols and ketones are obtained as by-products.

10. As indicated on the diagram (Drawing 1), the low-temperature plant delivers part of the manufactured semi-coking fuel to the electric-power station, a lesser part to the hydrogenation plant, specifically for the production of gas (the production of water gas which is processed into hydrogen for hydrogenation). All of the production of tar and oil is used for processing in the hydrogenation plant. The electric-power station furnishes the briquette factory, the low-temperature plant, the hydrogenation plant and the gas plant with steam of varying pressure and with electric power. The proportion of electric power to counter-pressure in the general production of electric power is here considerably greater than in a simple low-temperature-electric station of the type at Espenheim.

11. The combination of a low-temperature plant with a gas plant, operating on the principle of gasification under pressure (of from 20 to 25 atü) has a number of advantages. In the case of gasification under pressure, 75% coal tar is obtained (as opposed to 86 to 87 percent in the production of semi-coking fuel) but the gas tar is of a better quality than the tar obtained in the manufacture of semi-coking fuel. As a result of the supplementary quantity of gas tars, the capacity of the plant for hydrogenation is increased and better utilized. Equipment for the recovery of phenol and sulphur can process water gas and also hydro-sulphide alkalis from low-temperature and gas plants; as a result of this, they operate more economically. A small part of the low-temperature gas from the low-temperature plant may be compressed by means of rinsing under pressure freed from carbon dioxide, and after that, desulphurized in order to utilize it as an admixture for regulating the heating capacity of the high calorific gas for gasification under pressure. Gas generators, operating under pressure, are loaded with dry coal (size above 3 mm) from factories manufacturing briquettes for semi-coking purposes, with that portion of the briquette pieces larger than 3 mm sifted in front of the semi-coking equipment, and with extra briquettes, and the gasification productivity is thus based on the use of briquettes. The combination of the low-temperature and gas plants completely justifies itself. A similar combination on a small scale also exists in one enterprise in Hirschfeld.

12. The described development of the industrialization of soft brown coal by the low-temperature-electric stations and Kombinat consisting of low-temperature-electric-station plant, hydrogenation plants and gas plants, has proven itself successful. However, the capital investment in such an enterprise for the industrial utilization of coal is very high, and, according to the financial accounting carried by Dr. Riedel in Böhlen indicated in diagram No. 13, the thermal coefficient of the effective operation is only 33 percent. In this case electric power was figured out on the theoretical magniture of 860 k-kal/kilowatt hours. It is also necessary to consider that, from the point of view of the national economy, it is of course incorrect to assess liquid products only on the basis of their heating capacity.

13. Notwithstanding the successes achieved by the DDR national economic planning, it is impossible to itensify the program on the above described road of "industrial utilization" of brown coal by means of the low-temperature, electric-station, or of a Kombinat of low-temperature-electric-stations with hydrogenation plants and gas plants, inasmuch as the reserves of coal suitable for semi-coking fuels are insignificant and do not justify the construction of new a Kombinat on this basis.

14. In the postwar period in the DDR, we have taken a different road by which it is not necessary to be dependent on coal for semi-coking fuels with a high tar content, but it is possible to take as a basis soft brown coal with a relatively low tar content, to which, in fact, it is necessary to add a relatively low ash content and a low sulphur content. From such coal, by means of selection of high temperatures during gasification there can be produced brown coal high-temperature coke, which may be utilized to a certain degree in metallurgy (in deep-shaft furnaces), and to a large degree in heavy chemistry (the production of carbide, phosphorus, lime, dolomite, and for gasification). As a part of this development, the brown coal coking plant Lauchhammer was constructed, which produces one million tons of coke per year. It turns out, as a basic product, brown coal and, as a product of secondary importance, coking gas which is utilized as an industrial gas in metallurgy and heavy chemistry, or, after enrichment, as gas for public consumption (city gas). As a third group of products, liquids are obtained (tar, medium oil and light oil), and finally, as subsidiary products, phenol and ketone. But also, just as with the simple brown coal low-temperature plant, we would not wish to include this simple brown coal coking plant in the concept of "industrial utilization" of brown coal, because the brown coal coking plant produces the above-cited products, i.e. on a single-thread scheme, and sells them all without further processing.

Future Development in the GDR

15. The basic problem for the future development of the brown coal economy in the DDR is the expansion of the production of gas for public consumption to make up for the "anticipated shortage in gas" and also to achieve a per capita production of gas for public consumption up to a level which will meet the future requirements of industry and consumers. At the present time, the production of gas for public consumption in the GDR is 2.7 billion cubic meters, of which 6 percent is anthracite coal gas, 39 percent (sic) brown coal gas (gas from gasification under pressure, coking gas) and 4 percent represents other sources (imports, natural gas, industrial gases). It is planned that the production of gas by 1975 must be increased to eight to ten billion cubic meters. It is evident that, at the conclusion of such a development, the proportion of brown coal gas will increase by more than 80 percent (if natural gas is not available in larger quantities).

16. It is to be noted that an essential part of the future capacity for the production of gas will be provided by the presently existing Kombinat Schwarze Pumpe. In this Kombinat, the industrial utilization of brown coal will be carried out, and a special significance will be given to the production of gas. The Kombinat will operate on a three-thread scheme. It will produce gas in equipment for gasification under pressure, briquettes for marketing, and coke. Gas from coking plants will also be enriched for public consumption but will occupy only a small proportion in relation to the gas produced by gasification under pressure. The products of this Kombinat, the main emphasis of which will be on the production of gas, will be: gas for public consumption; briquettes; coke; tar (primarily from gasification under pressure, and to a lesser degree from the coking plant); electric power; and phenol. Electric power will be produced almost exclusively by the counter-pressure method.

17. The construction of such a huge installation for the production of gas under pressure, as in the case of Schwarze Pumpe, which, as yet, has not definitely established an annual production of gas, but which will reach from three to five billion cubic meters, creates great requirements with respect to technology for attaining the maximum possible productivity of labor. It goes without saying that it will be necessary to install generators with a diameter of four meters, which are being used in South Africa (Zassolburg) and which at the present time are being experimented with in the DDR. In addition, the productivity of installations for the production of oxygen is very important. In the gas plant in Böhlen units with a production of 1800 NM^3 per hour are established. One unit with a production of 3000 NM^3 per hour is undergoing testing at the present time. At the initial construction of the Kombinat Schwarze Pumpe, it was planned to have units for production of oxygen of 3000 NM^3 per hour and it was intended to experiment with one unit of 6000 NM^3 per hour. But it would without doubt be desirable to use installations with a production of oxygen of 12,000 NM^3 per hour. "The classical method of gas purification" operating on the basis of purification of gas through carbonic acid under pressure with subsequent dry desulphurization and drying of the gas in such large installations for gasification under pressure demands too great a capital investment, occupies large areas and requires a large number of servicing personnel. Therefore, it is planned to apply the 'Rectisol' method, which operates in cooled methane as a means for rinsing and which permits the removal of carbonic acid, hydrogen sulphide, organic sulphur, residues of gas benzine, and so on, by means of a single operation. As is known, this method was first applied in South Africa. It offers the possibility of extensive automation and the attainment of a high labor productivity.

18. The main question is, should the gas generators be fueled with briquettes or with granulated dry coal (from 3 to 15, or from 3 to 20 mm in size). As shown by past experience and production experience at the gas factory Böhlen, the gasification of briquettes furnishes a considerably higher productivity to the gas generators than the granulated dry coal. The economy achieved with respect to the generators, the basic costs, which in the overall cost of an installation of gasification under pressure constitute only 12 to 13 percent, are opposed on the other hand by the capital investment and the operational expenses in briquette making. Investigations of profits have led to the conclusion that for the Kombinat Schwarze Pumpe it was decided to fuel the gas generators by thoroughly-sifted dry coal of a size of 3 mm grains and above. Only that portion less than 3 mm will be used for briquette making. Depending upon future needs, briquettes in the form of small granulated briquettes will be available for sale to the public or will be used for gasification. Thus, preliminary installations will be obtained with a very high productivity with respect to the space occupied, which basically should be looked upon as drying installations, and only secondarily as briquette plants. The drying of coal is accomplished by steam in tubular dryers, with a heating surface of 4040 square meters, which were developed anew in the DDR. (Up to this time the largest tubular dryers had a heating area of 2220 square meters).

19. Drawing No. 3 is a diagram for an installation for gasification under pressure. The electric power station of the Kombinat will furnish steam for drying the coal with a pressure 3,5 atmospheres and for gasification under pressure of nearly 25 atmospheres, which meets all requirements for electric power. From one ton of unsorted coal with a moisture content of 58 percent is obtained 240 to 250 NM^3 of gas and 0,033 tons of liquid products.

20. In estimating the thermal coefficient for efficient operation, at the same time deriving the correlation between the heat involved chemically in the products obtained and between the incurred outlay of unsorted coal as against the thermal capacity of unsorted coal, an index of 55 percent is obtained by the Riedel method. According to preliminary figures, the cost of production of 1 NM^3 of gas represents 4 to 4,5 pf,* i.e. 1 to 1,2 pf per 1000 Kg. cal.

21. The question arises as to how further requirements in gas can be covered above the requirements satisfied by the construction of the Kombinat Schwarz Pumpe. Basically, the following methods exist:

    a. The construction of independent plants for gasification under pressure.

    b. The combining of electric power stations and installations for gasification under pressure.

    c. The preliminary degasification of soft brown coal prior to burning (energo technological method).

22. The resolving of this question according to the first method (a) can hardly be considered expedient. With this method, a relatively small productivity of the electric power station is obtained, i.e. the vzorozhaniye of the electric power station. If the yield of gas is reduced, then the production of steam must be reduced, and as a further consequence the yield of excess electric energy available for public consumption is decreased. Therefore, it seems that the best solution is the combination of installations for gasification under pressure with large condenser-type electric power station. Thus the production of electric power for gasification under pressure is reduced in cost.

23. If the yield of gas is decreased, then the electric power station can direct the surplus steam, which would otherwise go through the counter pressure turbines, to the condenser turbines, and thus the under-production of electric power for public consumption would not occur. The combining of the electric power station with the installation for gasification under pressure is completely feasible and, because gasification as well as burning is therefore a method which is suitable for coal with a high ash content, gasification can enable the utilization of beds of soft brown coal with high ash content.

[redacted] Comment: Probably indicates Pfennig. 25X1

24. It must be considered that, for the future, the energo technological method (the preliminary degasification of soft brown coal before its burning in the electric power station) is of special interest. In this method, the production of electric power is especially emphasized. The production of gas by means of degasification (the obtaining of rich gas) occupies a secondary position; the third place is occupied by liquid products which, under certain conditions, can be lost. In addition, this method is worked out so that highly productive related plants are used, which operate in close contact with the electric power station. The installation for degasification, it may thus be said, is not an independent partner with respect to the electric power station, but is a subsidiary installation of the electric power station. The energo technological method differs from the older low-temperature type of electric station developed in Germany, by the fact that in the latter (in addition to the electric power station) the production of tar is emphasized, and that, although the low-temperature plant and the electric power stations are connected to each other, they are, nevertheless, of equal value, and, to a large degree, independent partners.

25. The development of this energo technological method is being intensified greatly in the USSR. This problem is of international interest. They are also working on it in the U.S. and in the West German Republic. As far as we know, Czechoslovakia is also conducting experimental work. It would be valuable to discuss in detail the status of these developments.

26. As far as we know, in the Soviet Union they are striving for the realization of the energo technological method, basically in conformity with the plan outlined in Diagram No. 4, worked out for soft brown coal having moisture content. The coal is initially dried by means of smoke gases issuing from the electric power station boilers, and subsequently finally dried by means of swinging or vertical drying (with the aid of the burning of part of the generated strong gas) and then degasified in a degasser with circulating hot coke (incandescent coke) with a temperature of 1000° C. Coke which is separated during circulation is burned in the electric power station. The gas which is formed in the degasser (except for the part consumed in the swinging or vertical drying) is enriched in the condenser and in a gas purifier for city gas. Tar and light oil are extracted in the form of by-products during condensation.

27. The orientation in the field of energo technological method is also beginning to be developed in the DDR. The planned polytechnical experimental installation of the engineer-technical department of Bohlen will soon be completed. Dr. Riedel has worked out the course of work for this method as indicated in Diagram No. 5. Soft brown coal is usually dried in our installations by means of tubular dryers indirectly with steam, which is provided by the electric power station under pressure of 3,5 atmospheres. Dry coal is semi-coked in low temperature equipment by means of an air stream, and the heat medium is hot circulating gas which is indirectly heated through recovery devices. The recovery devices are fueled by smoke gas which is taken from the boilers of the electric power station. The coke obtained from this low-temperature apparatus with air stream is burned in the electric power stations. From the rotating gases, during condensation, tar and light oil are extracted. The separated tarless strong gas from the circulation of the rotating gas is enriched in the gas purifier (carbon dioxide and sulphur gases are washed out), compressed and made available as gas for public use.

28. The advantage of the energo technological method over that of separately producing electric current and gas consists in the anticipated high thermal efficiency, which, according to estimates of Dr. Riedel, represents approximately 7 percent. The power technological utilization in the DDR is of particular interest for ballast coals with high tar content, with respect to which the producing of briquettes for semi-coking is not economical. (The group "coal for semi-coking II, according to Bilkenrot and Ramiler).

Questions of the Development of "Industrial Utilization" of Soft Brown Coal in The Countries of the Socialist Camp.

29. The important problem for the future industrial utilization of soft brown coal is the intensified production of various synthetic gases for the chemical industry. In this respect, of special interest is the uniting of gasification under pressure with the synthesis of medium pressure according to the Fischer-Tropsch system, which was proposed ten years ago by Dorschner and also by Drave and Schoene, the first realization of which was carried out not with soft brown coal but with anthracite coal (at the Zassolburg installation) in South Africa. The techniques of organic chemistry will in the future be in need of products of synthesis with high content of olefins, as the basic material for the preparation of plastics, synthetic fiber and other processes.

30. In this process, from the gas obtained from gasification under pressure there is thus obtained residual gas with high methane content and completely free from sulphur, which it is possible to place at the disposal of the future gas supply after carbonic acid has been removed from it by means of washing. It possesses a heating capacity which is equivalent to natural gas. It is possible that a portion of the methane obtained by this method can be used for reprocessing into ethylene (for preparation of synthetic materials) and into acetylene (for the carbide industry and acetylene chemistry). Such methods are applied mainly in countries poor in oil. However, today it is still impossible to foresee whether or not the production of acetylene through methane can compete with the electro-thermal method (the preparation of acetylene from lime and coke from anthracite or soft brown coal) in particular if, for the production of carbide, the minimal load of the electric power station is systematically utilized (hours of weak load).

31. In countries which extract primarily hard brown coal, for the industrial utilization of brown coal, other methods must, in part, be selected other than those for soft brown coal. Attention is invited to the system presented in Diagram No. 6. After crushing, the coal is classified into sizes from 0 to 3 from 3 to 20, and over 20 mm, or from 0 3 to 3, from 3 to 30 and over 30 mm. The portion of coal from 0 to 3 mm goes into boilers for the production of steam, the portion from 3 to 20 (or 3 to 30 mm) is used for gasification under pressure for the production of pure or synthetic gas. The portion in excess of 20 or 30 mm is washed, dried by the Fleissner method and is sold in the form of dry coal. Products for sale are gas for future supply, dry coal, tar and surplus electric power.

25X1

32. Instead of gasification under pressure, the energo-technological utilization of coal is also foreseen; and for this method coal of a grain size of from 0 to 20 or 0 to 30 mm is required. Coke is also prepared from semi-coking or medium temperature for the smelting of iron in electric furnaces or in furnaces of the Krupp-Reni type, with respect to which attention is called to the system in Diagram No. 7. This system corresponds to Diagram No. 6, but to the Fleissner dryer is added, in addition, a semi-coking or coking oven. The semi-coke which is obtained is classified into sizes of 10 to 40 mm for electro furnaces and into from 0 to 10 mm for the Renni method.

25X1

Next 7 Page(s) In Document Denied